

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant: Takanori ITOU et al.
Title: POSITIVE ELECTRODE
MATERIAL FOR NON-
AQUEOUS ELECTROLYTE
LITHIUM ION BATTERY AND
BATTERY USING THE SAME



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DECLARATION UNDER 37 C.F.R. § 1.132

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

I, Takamitsu Saito, being duly warned, hereby declare and say that:

1. I am a citizen of Japan, residing at 11-5-3-702, Shimonamiki, Kawasaki-ku, Kawasaki-shi, Kanagawa 210-0025 Japan..

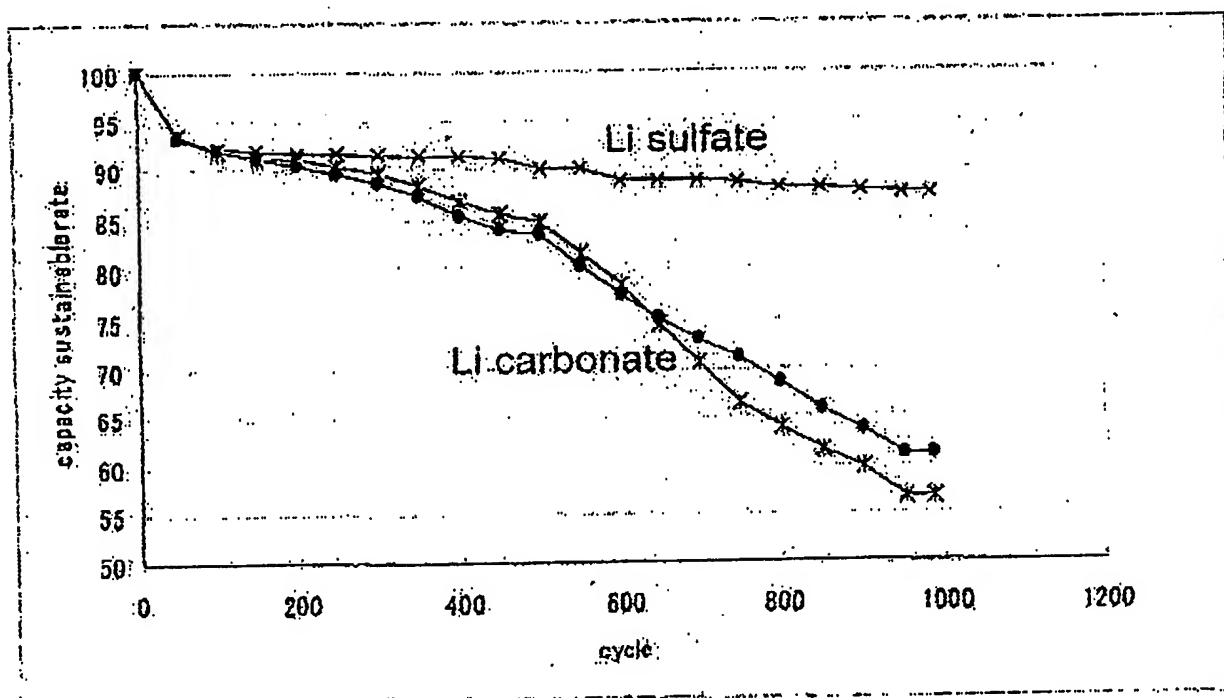
2. I am now employed by Nissan Motor Co., Ltd.

3. I am a co-inventor of the invention disclosed and claimed in the above-referenced application.

4. There are two purposes for this Declaration. The first purpose is to describe the results achieved during experiments related to the claimed invention. The second purpose is

to provide comments on Japanese Publication No. 07-245105, U.S. Patent No. 5,427,875, and U.S. Patent Publication No. 2003/0157409, which have been cited against this application.

5. Discussion of Experimental Results. I performed experiments comparing the decrease in capacity of non-aqueous electrolyte lithium ion batteries with positive electrodes comprising a lithium nickel oxide, on the surface of which various different lithium compounds are deposited. Two of the lithium compounds tested were lithium sulfate and lithium carbonate. The results of the experiments are depicted in the following graph, which shows the number of cycles through which the battery was tested on the horizontal axis (up to 1000 cycles) and the percentage of initial battery capacity on the vertical axis.



6. I have extensive experience in the design of non-aqueous electrolyte batteries, and particularly in the design of lithium ion batteries. My sincere belief is that the combination of a lithium nickel oxide and a lithium sulfate being deposited is a positive electrode for a non-aqueous electrolyte lithium ion battery was never known, used, or suggested. This is why the present application was filed. In fact, the essence of the invention of claim 1 is that the combination of an oxide containing lithium and nickel and a lithium sulfate being deposited

provides dramatic improvement in the sustainable capacity of a lithium ion battery. This improvement in sustainable capacity is so dramatic as to be entirely unexpected.

7. The entirely unexpected results from this combination are shown in the above graph. Specifically, the graph shows that the battery with a lithium sulfate being deposited on the oxide of the positive electrode retained nearly 90% of its initial capacity after 1000 cycles. The battery with a lithium carbonate being deposited on the oxide of the positive electrode retained, on average, only 58% of its initial capacity after 1000 cycles. The superiority of lithium sulfate for this use was entirely unexpected.

8. Batteries using a lithium nickel oxide as the positive electrode material suffer from the problem that oxygen ions are oxidized by nickel ions with high valence within the positive electrode material into oxygen radicals and released to decompose the electrolyte solution in the battery. Lithium sulfate, when deposited onto the lithium nickel oxide, is drastically superior to lithium carbonate at preventing oxygen radicals from being emitted into the electrolyte solution. The results achieved by using lithium sulfate instead of lithium carbonate were entirely unexpected.

9. Comments on the Prior Art. As previously mentioned, I have extensive experience in the design of non-aqueous electrolyte batteries, and particularly in the design of lithium ion batteries. My sincere belief is that a person skilled in my field would not have looked U.S. Patent Publication No. 2003/0157409 ("Huang") to address the problems solved by the present invention. A person skilled in the design of lithium ion batteries would not have been motivated to combine Huang with either Japanese Publication No. 07-245105 or U.S. Patent No. 5,427,875 to create a positive electrode material comprising a lithium nickel oxide and a lithium sulfate coating. Huang simply lists a variety of possible materials out of which a slurry can be created to coat a positive electrode. Huang never suggests depositing lithium sulfate onto a positive electrode comprising lithium nickel oxide, so it could not possibly recognize the benefits of a lithium sulfate being deposited on a lithium nickel oxide positive electrode. Lithium sulfate is simply one of the twenty-two (22) possible slurry materials listed in claim 5 of Huang. In fact, lithium sulfate seems to have been added to claim 5 of Huang as an afterthought, because the specification of Huang does not even mention the

possibility of using lithium sulfate as a slurry material, much less a slurry material deposited on a lithium nickel oxide positive electrode.

10. I further declare that all statement made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further, that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent resulting therefrom.

Date: 1/24/2011

Signature: Takamitsu Saito

Takamitsu Saito